SEASONAL FLIGHT ACTIVITY OF MALE VELVET ANTS (HYMENOPTERA: MUTILLIDAE) IN SOUTH FLORIDA[1]

Mark Deyrup[2], Donald Manley[3]

ABSTRACT: Seasonal male flight data from a four-year study are presented for 19 species of mutillids belonging to the genera *Ephuta*, *Photomorphus*, *Pseudomethoca*, *Sphaeropthalma*, and *Timulla*. A total of 2,391 specimens was collected. At the study site in southern Florida, most species flew during at least 8 months of the year. Two species flew only late in the year. All species showed marked fluctuations in abundance from year to year.

Velvet ants (Hymenoptera: Mutillidae) are solitary parasitoid wasps, most of them having as hosts pupae or mature larvae of bees and wasps (Mickel, 1928). Male flight activity is particularly important for gene flow in this group, as females are always apterous, and aerial dispersal is by males. Males of a few species pick up and transport females, and might cross barriers that would baffle an earth-bound female (Evans, 1969). We have collected in Malaise traps copulating pairs of *Timulla floridensis*, *Ephuta floridana*, *E. pauxilla*, and an associated pair of *E. slossonae*. Male flight activity also offers the best methods for estimating relative numbers of adults of a species, as the males seem rather vulnerable to Townes traps (modified Malaise traps). Females can be sampled with pitfall traps, but we have found that the numbers of specimens collected in such traps is relatively small, even when there are many traps and their efficiency is enhanced with long metal barriers (drift fences) that direct the mutillids into the traps. Nothing has been published on the seasonal flight patterns of male mutillids. The purpose of this paper is to contribute basic information on this little-known group of insects, and to provide a data base that could be used in comparative studies of seasonality elsewhere.

MATERIALS AND METHODS

The study site is on the Archbold Biological Station (Highlands County), located at the southern end of the Lake Wales Ridge in south-central Florida. The site is in a transitional zone between warm and subtropical zones. Winters are mild and dry, with temperatures during some years falling below 0°C for a few hours. Sheltered microhabitats are

[1]Received June 8, 1989. Accepted July 10, 1989
[2]Archbold Biological Station, P.O. Box 2057, Lake Placid, FL 33852
[3]Department of Entomology, Clemson University, Pee Dee Research and Education Center, Route 1, Box 531, Florence, SC 29501

frost-free. Summers are warm and humid, with daytime temperatures over 25°C. Mutillid species diversity is high, with over 30 species known. The vegetation of the study site is a thin canopy of sand pine (*Pinus clausa* Chapman), with a thick 1.5 - 3.5m understory of scrub oaks (*Quercus* spp.), staggerbush (*Lyonia* spp.), silk bay (*Persea humilis* Nash), scrub pawpaw (*Asimina obovata* Nash), and scrub hickory (*Carya floridana* Sargent). The paths through this thick brush appeared to act as flight cordiors for mutillids.

Mutillids were collected in 2 small Townes traps (modified Malaise traps) that were set up across 2 east-west paths. The traps were kept in place and continuously monitored from May 1983 through December 1986. Each trap was annually replaced with an identical trap to forestall the effects of wear. Specimens were collected 3 times a week. The mutillids were identified by the authors. Specimens of all species are in the collection of the Archbold Biological Station and in the collection of Donald Manley. Synoptic collections of most species have also been deposited in the Florida Collection of Arthropods (Gainesville) and the collection of Denis Brothers (University of Natal, Pietermaritzburg, South Africa).

RESULTS

Over the 4-year period, the traps collected 2,391 specimens belonging to the genera *Ephuta*, *Pseudomethoca*, *Timulla*, *Photomorphus*, and *Sphaeropthalma*. Many specimens of *Dasymutilla* were also collected; these are not discussed here because of problems with the identification of some species.

Ephuta floridana Schuster. 50 of 51 specimens taken May-December (Figure 1). Annual numbers from 6 (1984) to 27 (1986).

E. stenognatha Schuster. 94 of 100 specimens taken May-November (Figure 2). Annual numbers from 4 (1986) to 64 (1983).

E. slossonae (Fox). 132 of 134 specimens taken April-November (Figure 3). Annual numbers from 20 (1984) to 46 (1986).

E. margueritae Schuster. All 118 specimens collected April-December (Figure 4). Annual numbers from 8 (1984) to 44 (1986).

E. pauxilla Bradley. 40 of 42 specimens collected April-November (Figure 5). Annual numbers from 3 (1093) to 15 (1985, 1986).

E. spinifera Schuster. No specimens collected 1983-1986. 8 specimens collected in July-August 1987, in a temporary trapping site in mature sand pine scrub.

Photomorphus paulus (Bradley). 885 of 888 specimens taken April-November (Figure 6). Annual numbers from 85 (1985) to 354 (1984).

P. alogus Viereck. All 18 specimens collected June-December. Annual numbers from 1 (1986) to 9 (1983).

P. archboldi Manley and Deyrup. All 12 specimens collected May-October. Annual numbers from 1 (1986) to 5 (1984).

Pseudomethoca oculata (Banks). All 129 specimens taken September-December (Figure 7). Annual numbers from 13 (1985) to 59 (1983).

P. sanbornii (Blake). 69 of 71 specimens collected May-November (Figure 8). Annual numbers from 3 (1985) to 50 (1983).

P. simillima (Smith). 63 of 67 specimens collected October-November (Figure 9). Annual numbers from 12 (1983) to 32 (1986).

P. torrida Krombein. 418 of 425 specimens collected May-November (Figure 10). Annual numbers from 58 (1985) to 158 (1983).

P. vanduzei Bradley. All 18 specimens collected April-October. Annual numbers from 2 (1984) to 6 (1985).

Sphaeropthalma pensylvanica (Lepeletier). All 17 specimens collected April-December. Annual numbers from 3 (1985, 1986) to 6 (1983).

Timulla dubitata (Smith). 25 of 26 specimens collected May-September (Figure 11). Annual numbers from 1 (1985, 1986) to 12 (1983, 1984).

T. floridensis (Blake). 262 of 269 specimens collected March-December (Figure 12). Annual numbers from 46 (1984) to 118 (1983).

T. ornatipennis (Bradley). 2 specimens, July 1983.

T. vagans (Fabricius). 1 specimen, May 1983.

DISCUSSION

At the Archbold Biological Station, males of most mutillid species are active over a long period. Eight of the 12 species represented by at least 25 specimens were active during 8 or more months of the year. The prolonged flight season is likely to be related to the mild climate of the study site, though complementary data from farther north are needed to support this conclusion. As can be seen from the graphs (Figures 1-12), most species are slow to begin flight activity in the spring. Flight activity is seasonally less symmetrical than monthly average temperatures at the station. Two species, *P. oculata* and *P. simillima*, have flight seasons restricted to late in the year (September-December). There are no corresponding spring-flying species. One species, *P. paulus*, shows a consistently bimodal pattern reflecting a reduction in numbers in August and September.

When species are active over a long period, a record of flight activity does not provide good estimates of longevity. *P. oculata* and *P. simillima*, with their short flight seasons, provide more useful information. Assuming that large reductions from one month to the next reflect natural mortality rather than a drastic effect of the traps on local populations, many males of these species must live a month or less. The short life spans of these species may not be typical if cooler temperatures in December and late November are killing males. There is a case of an individual male *Dasymutilla foxi* (Cockerell) that lived about 6 months in captivity (J. Schmidt, personal communication).

The flight activity of males is presumably related to emergence of females. Females apparently mate only once, immediately after emergence (Brothers, 1972; J. Schmidt, personal communication). Male flight activity need not closely reflect total seasonal activity of females, as at least some female mutillids appear to be long-lived insects (Schmidt, 1978). Female *P. oculata* and *P. simillima*, for example, are active in spring and early summer, when there are no records of males. The fall and winter emergence of these species may actually indicate a heavy dependence on early spring hosts, rather than a dependence on fall or winter hosts.

All species showed marked variation in annual abundance, with maximum annual collections at least twice minimum collections. The seven most frequently collected species showed no clear evidence that their numbers were similarly and simultaneously affected by common factors such as rainfall or temperature. The fluctuations seen in these species may be unintelligible until we have identified hosts and know something of the population dynamics of these hosts.

SUMMARY

At our study site in southern Florida, most species of mutillids fly through much of the year. With the exception of 2 species of *Pseudomethoca*, there is no evidence of phenological niche partitioning or dependence on hosts that are only available for a short season. All abundant species showed large population fluctuations during the 4-year study period. We hope that our information will encourage publication of similar data sets from other areas. We would like to think that our work is the first of a series of studies of geographic phenological variation in mutillids, that can be interpreted in terms of evolutionary pressures exerted by different climatic regimes.

ACKNOWLEDGMENTS

We thank Nancy Deyrup for tabulating the data and creating and preparing the graphs. Justin Schmidt (Carl Hayden Bee Research Center, Tucson, AZ), and Fred Lohrer (Archbold Biological Station), and two anonymous specialists reviewed the manuscript and provided useful comments. The manuscript was typed by Patricia Bache.

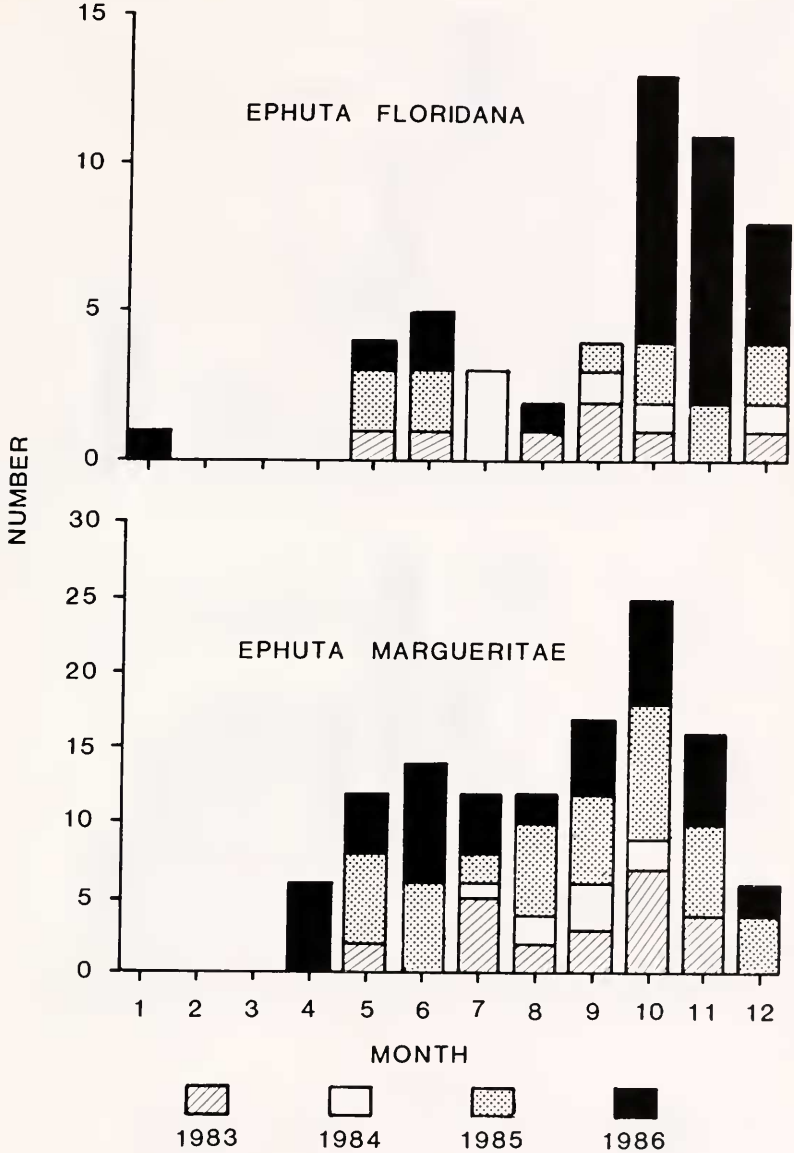
LITERATURE CITED

Brothers, D.J. 1972. Biology and immature stages of *Pseudomethoca F. frigida*, with notes on other species (Hymenoptera: Mutillidae). Univ. Kansas Sci. Bull. 50: 1-38.

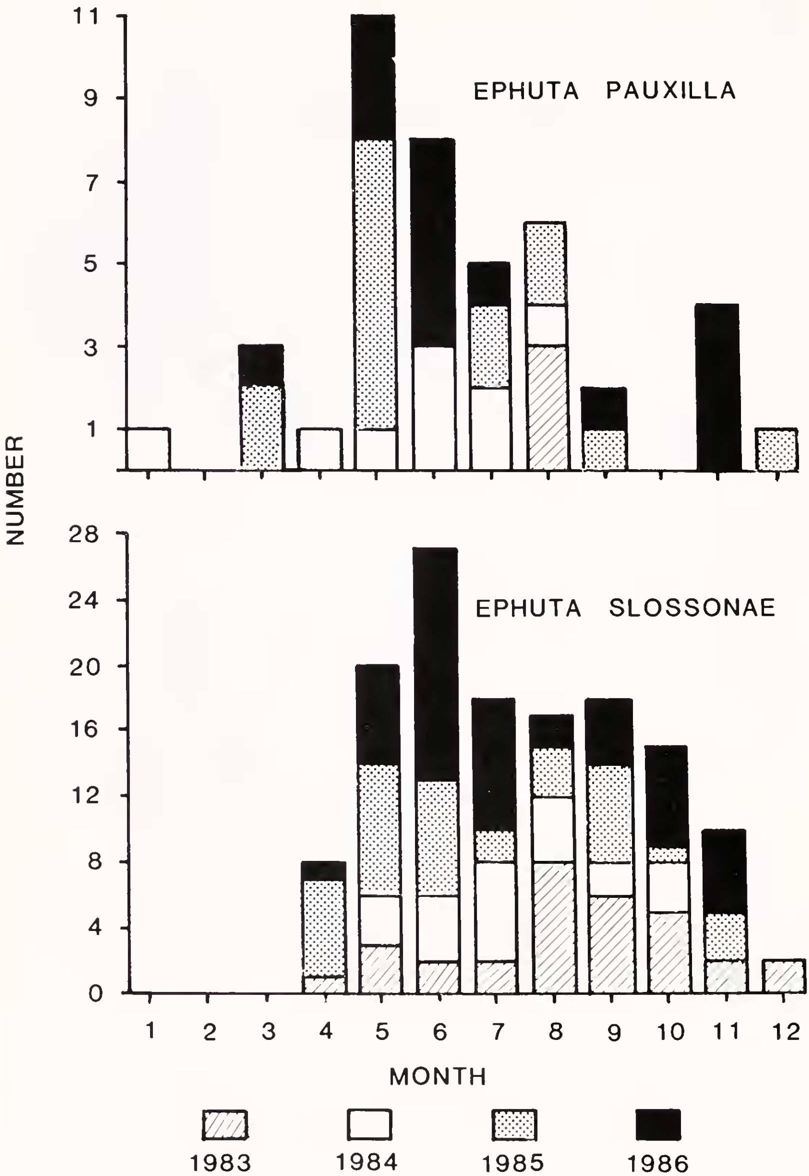
Evans, H.E. 1969. Phoretic copulation in Hymenoptera. Entomol. News 80:113-124.

Mickel, C.E. 1928. Biological and taxonomic investigations on the mutillid wasps. Bull. U.S. Nat. Mus. 143: ix + 351 pp.

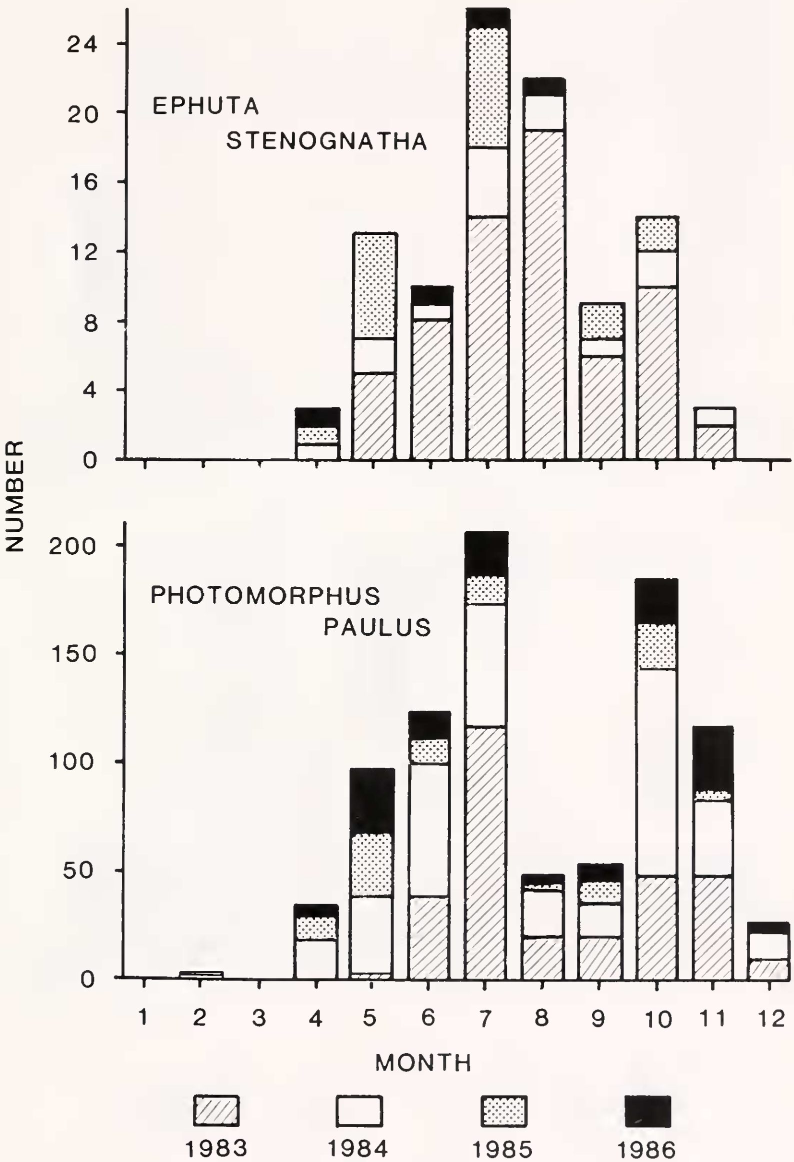
Schmidt, J.O. 1978. *Dasymutilla occidentalis*: a long-lived aposematic wasp (Hymenoptera: Mutillidae). Entomol. News 89: 135-136.



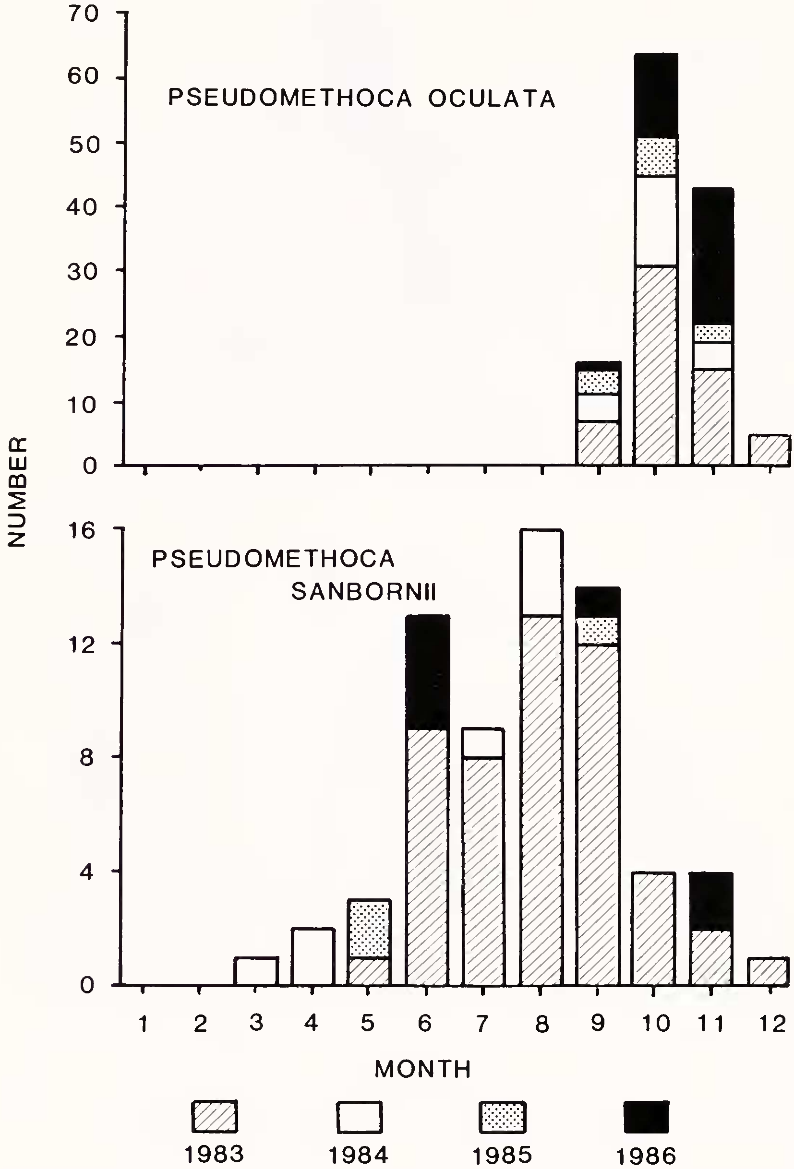
Figures 1 and 2. Seasonal flight, *Ephuta floridana* and *E. margueritae*



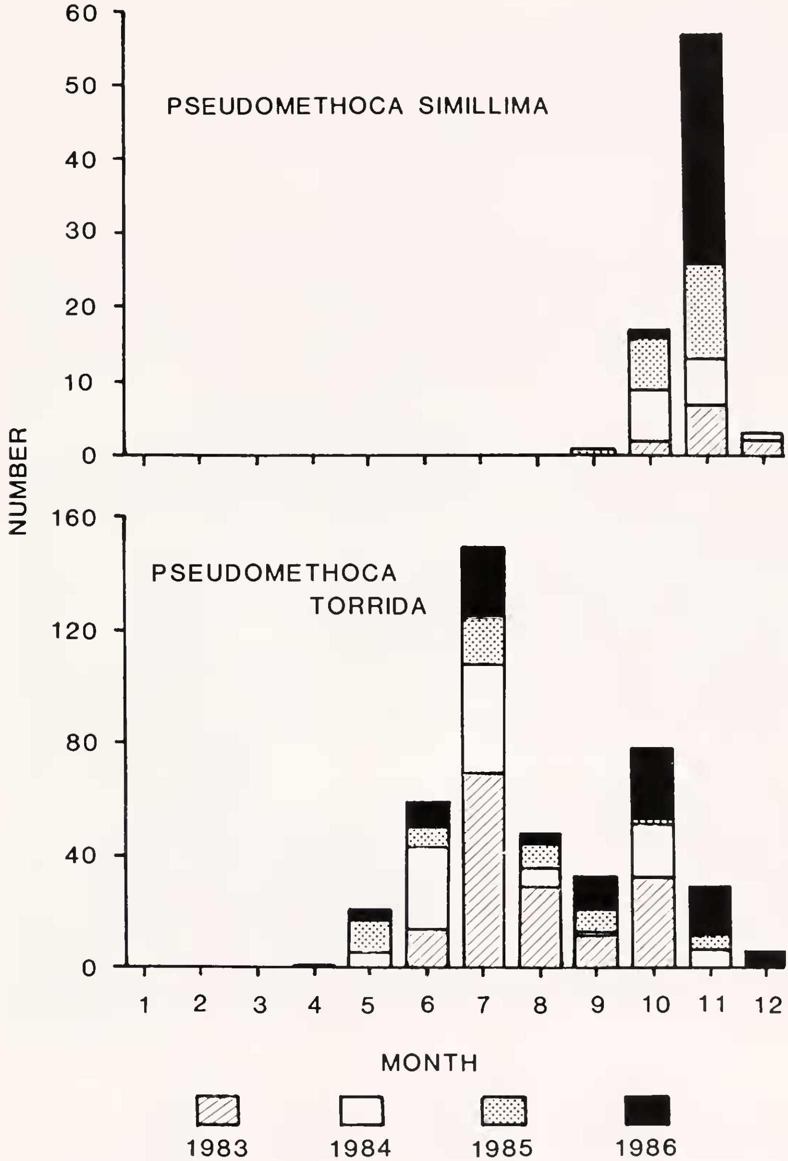
Figures 3 and 4. Seasonal flight, *Ephuta pauxilla* and *E. slossonae*



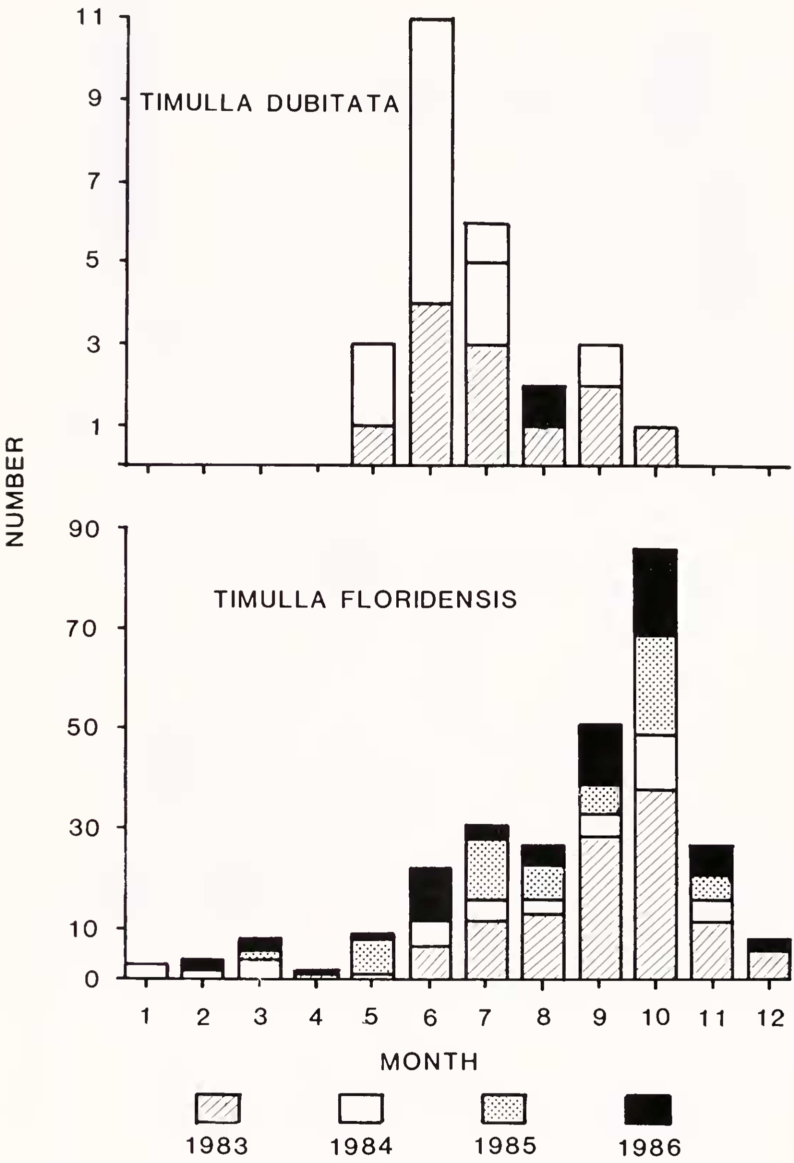
Figures 5 and 6. Seasonal flight, *Ephuta stenognatha* and *Photomorphus paulus*



Figures 7 and 8. Seasonal flight, *Pseudomethoca oculata* and *P. sanbornii*



Figures 9 and 10. Seasonal flight, *Pseudomethoca simillima* and *P. torrida*



Figures 11 and 12.Seasonal flight, *Timulla dubitata* and *T. floridensis*